

WATER QUALITY ACTION PLAN

Overview

This action plan describes the Sanctuary's management strategies for understanding and addressing water quality. Traditionally, the Sanctuary's water quality efforts have been primarily limited to supporting select monitoring projects conducted by outside parties, facilitating public discussion and investigation of water quality issues (through the Sanctuary Advisory Council and its working groups) and producing various education and outreach materials aimed at teaching basic water quality and watershed science as well as promoting practices to limit pollution. This action plan addresses the need for and commitment of CINMS to work in partnership with many individuals and entities to find answers to important unanswered questions about water quality, from science to management policies and regulations.

The offshore water quality monitoring strategy contained in this action plan demonstrates the NMSP's ongoing commitment to better understand water quality conditions and dynamics in the Southern California Bight and Santa Barbara Channel. Water quality monitoring data is used to evaluate and understand localized and large-scale spatial and temporal impacts from natural and anthropogenic sources, and their potential or actual impacts on Sanctuary resources. These data may also have utility for evaluating the effectiveness of water quality management efforts over time. The NMSP commitment to water quality is bolstered by several NMSP-wide performance measures pertaining to water quality:

- By 2015, 12 sites with water quality being maintained or improved;
- By 2010, 100% of the [National Marine Sanctuary] System is adequately characterized; and
- By 2020, 14 sites that have implemented monitoring programs, based on the System-Wide Monitoring program framework, for relevant natural and maritime archaeological resources.³⁶

The water quality protection planning strategy (WQ.2) explains how the Sanctuary will prioritize threats and look for potential areas of cooperation and integration with existing water quality resources and management programs. CINMS will take a partnership-based approach to water quality protection in order to leverage outside resources and expertise and given that many priority Sanctuary water quality issues may be best addressed by management programs already established in the region. A key to making progress on protecting Sanctuary water quality is to recognize which programs are most suitable for addressing water quality issues, and, if necessary, identify how these programs can be enhanced to ensure appropriate water quality conditions. It is also important to determine if any water quality issues warrant the inception of additional Sanctuary-directed water quality protection programs.

The Sanctuary developed this action plan with guidance from the NMSP West Coast Region Water Quality Coordinator. This position was originally intended to serve as the lead for implementing Strategy WQ.2, and to provide overall guidance for implementing this action plan. However, this position has been vacant since 2006. Consequently, until or unless CINMS and West Coast Region staff are able to acquire dedicated water quality personnel, other staff will strive to implement this action plan.

³⁶ Program-wide performance measures are contained in the Performance Evaluation Manual for the Office of National Marine Sanctuaries, which is available online at <http://sanctuaries.noaa.gov/management/effective.html>.

Recent Water Quality Work in the Sanctuary

In 2005 the Sanctuary Advisory Council adopted a water quality report submitted by the Advisory Council's Conservation Working Group: *A Water Quality Needs Assessment for the Channel Islands National Marine Sanctuary*.³⁷ The report contains over twenty specific recommendations within the general categories of water quality: 1) action planning; 2) research and monitoring; 3) jurisdiction, regulations, and policy; and 4) public education and outreach. These recommendations are presented in Appendix E. The report also contains detailed descriptions of water quality pollution sources. The information and recommendations contained in the Advisory Council's assessment, coupled with the information and activities provided in this action plan provide a knowledge base, and framework that the Sanctuary can use to build a water quality program.

Assessing water quality conditions in the Sanctuary will be greatly assisted by the work of Dr. Diana Engle, who in 2006 developed a report for the National Park Service entitled, *Assessment of Coastal Water Resources and Watershed Conditions At Channel Islands National Park California*.³⁸ The purpose of this report was to:

...examine existing information pertaining to water quality, the condition of aquatic habitats and their biota, sources of point and non-point pollution in the region, avenues of transport of pollutants to Park waters, and threats to aquatic resources stemming from consumptive and non-consumptive uses of Park habitat. In addition, the report identifies current information gaps and makes recommendations for addressing them. (Engle 2006)

Dr. Engle has partnered with Santa Barbara Channelkeeper to help develop a water quality characterization report for the Sanctuary, described below in Strategy WQ.2.

In 2005, CINMS partnered with Santa Barbara Channelkeeper to develop a pilot water quality monitoring project for the waters off of Santa Cruz and Anacapa islands (described in more detail in Strategy WQ.1). The pilot program was a cooperative effort to better understand existing conditions and potential water quality issues associated with boating within the Sanctuary, especially at anchorages. The pilot project can help to inform decisions about when, where, and how to conduct long-term water quality monitoring at the islands.

Description of the Issues

Sanctuary water quality was a commonly expressed issue at all of the management plan revision public scoping meetings. In recent years, the increased frequency and extent of regional beach and shellfish-bed closures coupled with decreases in some local fishing catches are taken as signs of declining water quality in the Sanctuary region. CINMS received scores of comments on water quality issues from various interests in the regional communities. Sanctuary staff, working with the Advisory Council, then synthesized the comments related to water quality, researched the issues more fully, and developed the following list of priority sub-issues:

- CINMS needs a comprehensive, coordinated plan for protecting resources from water quality impairment;
- CINMS should increase water quality public awareness, research and monitoring;

³⁷ The water quality needs assessment is available on line at: <http://channelislands.noaa.gov/sac/pdf/10-17-05.pdf>.

³⁸ Dr. Engle's report is available online at: <http://www.nps.gov/chis/naturescience/assessment-of-coastal-water-resources.htm>.

- The Sanctuary should be proactive about terrestrial impacts on water quality;
- CINMS should address water quality impacts from outside the Sanctuary boundary from potential sources such as power plants, vessels, coastal runoff, treatment plants and shipwrecks containing hazardous materials; and
- The Sanctuary should increase partnerships with coastal watershed and water quality groups, other regional water quality authorities, and organizations currently collecting water quality data.



Figure 43. Willows Anchorage, Santa Cruz Island
(Adrian M. Wenner)

These sub-issues indicate water quality in the study area and Sanctuary is affected by pollution from a variety of terrestrial and marine-based activities and land uses. Because many pollutants can be carried to the Sanctuary by ocean currents, the spatial extent of water quality threats is much larger than the Sanctuary itself. This pollution is from both point sources (such as power plants or treatment plants) and nonpoint sources (such as urban runoff), explained in more detail below. These sub-issues also demonstrate a need for greater coordination among the numerous federal, state, and local government entities and other organizations playing roles in water quality protection within the study area. For example, various aspects of water quality in the study area are addressed by the U.S. Environmental Protection Agency Region Nine, the California State Water Resources Control Board, the Central Coast (region three) and Los Angeles (region four) Regional Water Quality Control Boards, the California Coastal Commission, Ventura and Santa Barbara Counties, and many municipalities, to name a few. CINMS will build partnerships with these and other water quality authorities and organizations to determine which programs best address particular water quality issues, to enhance existing water quality protection programs, to identify needs for additional programs, and to address water quality education and outreach, and research and monitoring.

Two categories of pollution are the principal factors affecting Sanctuary water quality: point source and non-point source. When it occurs, *point source pollution* can be traced to identifiable sources, such as oil platforms, power plants, ocean dumping and marine debris sites, industrial effluent discharge sites, municipal sewage treatment plants, and surface runoff (including storm outfalls and dry weather flows). *Nonpoint source pollution* originates from diffuse sources, such as atmospheric deposition and agriculture, urban, and industrial activities. As runoff moves over and through the ground picking up and carrying away natural and human-made pollutants, it deposits them into lakes, rivers, wetlands, and coastal waters.

Point and nonpoint source pollution can impact marine resources in a number of ways. Toxic effluents can lead to metabolic impairment or cellular damage, physiological damage or behavioral changes at the organism level, changes in mortality or biomass at the population level, and changes in species distribution or altered trophic interactions at the community level (Klee 1999). Re-suspended sediments

may impact benthic marine life by interfering with filter feeding and respiratory functions and causing a loss of food sources and habitats. Organic contaminants in the marine environment may lower photosynthesis and oxygen levels and introduce disease. High nutrient concentrations can lead to eutrophication, causing excess algal growth and oxygen depletion. Some point source discharges have the potential to introduce non-native species into the environment. Marine debris can lead to injury or mortality of marine mammals and seabirds through ingestion and entanglement. Effluents may introduce disease-causing microorganisms (pathogens), such as bacteria, protozoans, and viruses, into the marine environment.

Numerous statutes regulate a variety of issues related to water quality. Many of the programs these acts established, and the agencies charged with implementing them are described in detail in the FEIS (Vol. II, Sections 3.3.5, 3.5.3.4, 3.5.4.4, and 5.2).

Point Source Pollution

Approximately 82 percent of municipal wastewater effluents, 70 percent of the power plant-returned cooling waters, 95 percent of the discrete industrial wastes, and 71 percent of the surface runoff into the Southern California Bight enters the coastal waters between Point Dume and San Mateo Point (Anderson *et al.* 1993), which incorporate the mainland coast adjacent to the Sanctuary. Anderson *et al.* (1993) also identified 178 discrete sources of contaminant and nutrient input to the Southern California Bight from Point Conception to the Mexican border. Of these, 26 are in the Channel Islands region and consist of oil platforms, sewage outfalls, power plants, ocean dumping sites, industrial waste, and storm water outfalls. Potential impacts to Sanctuary water quality from these sources vary and are described below.

Municipal Treatment Plants

Most of the water used for domestic and industrial purposes in the coastal region adjacent to the Sanctuary enters municipal treatment (or sewage) plants³⁹ and eventually empties into the ocean (Table 8). The largest freshwater inputs (and probably the largest sources of nutrients and contaminants) in the waters in and around the Sanctuary are the Santa Clara and Ventura Rivers and the Oxnard municipal treatment plant (Anderson *et al.* 1993).⁴⁰

Table 8. Publicly Owned Treatment Works (POTW) Discharging Into the Sanctuary Region

POTW Name	Receiving Water	Level of Treatment	Volume Discharging (mgd)
City of Lompoc	Santa Ynez River	Secondary	3.72
Goleta	Santa Barbara Channel	Primary/Secondary	5.2
Santa Barbara	Santa Barbara Channel	Secondary	8.1
Montecito	Santa Barbara Channel	Secondary	1.1
Summerland	Santa Barbara Channel	Tertiary	0.17
Carpinteria	Santa Barbara Channel	Secondary	1.5
Oxnard	Santa Barbara Channel	Secondary	19.5

Source: Anderson *et al.* 1993

Sewage discharge can result in significant negative impacts to humans and coastal and marine resources. These impacts are typically caused by:

³⁹ Surface runoff is approximately 68% the volume of municipal wastewater discharge (Polhemus 2006).

⁴⁰ Pursuant to the FWPCA, municipalities are required to provide secondary treatment (physical and biological) of discharge. However, FWPCA 301(h) allows the EPA to waive the full secondary sewage treatment requirement if a municipality meets certain conditions specified in that section. The Central Coast Regional Water Quality Control Board has issued Goleta Sanitary District a timeline to upgrade their treatment plant to full secondary standards by November 1, 2014.

- Introduction of disease-causing bacteria;
- Eutrophication (the introduction of excess nutrients, causing excess algal growth and oxygen depletion);
- Introduction of suspended particulates; and
- Introduction of toxic wastes, heavy metals and PCBs.

Power Plants

Power plants discharge cooling water carrying waste heat, along with a small volume of contaminants such as chlorine. The volume of discharges from power plants is 10 times the volume of discharges from municipal wastewater treatment plants; moreover, power plant discharges yield the largest volume of inflow in the Southern California Bight (Anderson *et al.* 1993). Currently, two power plants (both located in Ventura County) discharge into the Sanctuary region. Power plants may have the following impacts on marine organisms and habitats:

- Effluent toxicity;
- Sediment input and destruction of benthic biota;
- Interference with the filter feeding and respiratory functions of marine organisms;
- Loss of food sources and habitats;
- Impingement of living marine resources on cooling water intake screens and entrainment through cooling water systems; and
- Thermal impacts from cooling water.

Oil and Gas Activities

Sanctuary water quality is susceptible to potential oil-well blowouts, pipeline leaks, oil tanker spills, activities associated with decommissioning of platforms (see the oil and gas issues description in the Emergency Response & Enforcement Action Plan), and natural seepage. In addition, pollutant discharges are associated with routine operations of oil and gas development, including the release of effluents consisting of drill cuttings and mud, sewage, formation waters, and corrosion products.⁴¹

Oil and Gas Seeps

As described in the FEIS affected environment section, there are numerous naturally occurring oil and gas seeps in the Santa Barbara Channel (Norris and Webb 1990). The rate of oil seepage from the South Ellwood anticline, located about three kilometers offshore in the Santa Barbara Channel, is one of the highest in the world. The seeps are a major source of marine pollution because the oil they release accumulates in large slicks. This natural seepage releases more hydrocarbon gases than all of the mobile sources (mostly automobiles) in Santa Barbara County.

⁴¹ Platforms in federal waters can either discharge to the ocean in compliance with the National Pollutant Discharge Elimination System (NPDES) permit requirements or send their discharges ashore for treatment and disposal. Discharges from oil and gas operations in state waters are regulated by discharge permits, which specify limits for waste discharge constituents, as well as monitoring requirements for verifying compliance with permit conditions and ensuring the discharges do not cause significant impacts to the quality of receiving waters. Although platforms in state waters are permitted to discharge to the ocean, most discharges are sent to onshore facilities. Muds and cuttings are transported to landfills for disposal. Produced water is either re-injected back into the well or sent ashore to a produced water treatment facility where it may then be discharged to the ocean or to a sewer system. Sanitary waste is either discharged to the ocean, or transported to shore and discharged to a sewer system.

Ocean Dumping, Disposal and Marine Debris

Active dredged material disposal sites in the Sanctuary region include the Los Angeles/Long Beach LA-2 (Anderson *et al.* 1993) and the base of Hueneme Canyon (NOAA 1996). Inactive sites, which may act as nonpoint source pollution sites, include chemical dumpsites located in the vicinity of the Santa Lucia Bank and south of Santa Cruz Island formerly designated and/or used for government chemical munitions dumping; an area southeast of Santa Barbara Island charted as a disused explosives dumping area (NOAA 1996); and a low-level radioactive waste dumpsite offshore from Point Hueneme (U.S. EPA 1983).

Typically, water quality impacts from dumping and /or disposal are highly dependent on such factors as ocean currents and distribution of contaminants, chemical interactions of dumped/disposed materials in water and associated degradation time, and short-term and long-term biological effects of absorption in living marine resources (such as invertebrates, marine mammals and fish).

Disposal of industrial effluents can include toxic organic chemicals such as detergents, oil and industrial solvents, as well as toxic metals such as mercury and lead. Industrial contaminants can affect marine organisms at several levels, including:

- Metabolic impairment or damage at the cellular level;
- Physiological damage or behavioral changes at the organism level;
- Changes in mortality or biomass at the population level; and
- Changes in species distribution or altered trophic interactions at the community level (Klee 1999).

Most marine debris is land-based in origin and can come from such sources as malfunctioning sewage treatment plants, sewer overflows, inadequate solid waste programs and facilities, beach users, and storm water runoff. This debris may be inadvertently deposited, such as debris lost at sea or blown into the ocean. Marine debris also comes from accidental discard and illegal trash dumping at sea. Illegal dumping poses a threat to human health and safety, and injures and kills marine mammals, seabirds and sea turtles through ingestion and entanglement. A Southern California Coastal Water Research Project (SCCWRP) study found man-made

The Case of the Pacbaroness

A recent example of a toxic accident near the Sanctuary involved the bulk-carrier *Pacbaroness*, which collided with the car carrier *Atlantic Wing* off Point Conception in 1987. The *Pacbaroness*' cargo consisted of over 21 thousand metric tons of bulk copper concentrate. The copper concentrate cargo was observed discoloring the water as the vessel sank. Researchers recently began collecting sediment samples from the vicinity of the vessel to determine the extent of copper contamination, although these have not yet been summarized. The amount of copper concentrate that has entered the environment as a result of this accident remains unknown. Copper concentrate is toxic to marine organisms.

In addition to copper concentrate, the *Pacbaroness* held a combined volume of approximately 379,000 gallons of fuel and lubricating oil. Oil reaching the surface in the first few hours after the *Pacbaroness* sank was estimated at 20,000 to 75,000 gallons. Significant amounts of oil continued to leak for another four days then tapered off to an estimated few gallons a day.



The Pacbaroness Sinking, 1987
(Glenn Allen)

debris occurred in approximately 14 percent of the mainland shelf of the Southern California Bight (Moore and Allen 1999). Man-made debris was most common in the central (urbanized) region on the outer shelf, and in areas near municipal sanitary sewer system outlets (Moore and Allen 1999). With support from NOAA's Marine Debris Program, CINMS has worked on marine debris removal projects with partners including the City of Santa Barbara, and the University of California Davis' SeaDoc Society.

Vessel Discharge/Deposit

Discharge of oil, sewage, graywater and non-biodegradable materials from vessels is an ongoing issue of concern for the Sanctuary, particularly with regard to such discharges from large vessels like cargo ships and cruise ships. Although pollutant discharge/deposit is strictly regulated in Sanctuary waters, awareness of and compliance with these regulations is an ongoing challenge for CINMS management. In addition, polluting activities occurring beyond the boundary of the Sanctuary (e.g., spills or discharges) pose a threat to and may negatively impact Sanctuary resources and qualities.

Vessel sewage discharges are more concentrated than domestic land-based sewage. They may introduce disease-causing microorganisms (pathogens), such as bacteria, protozoans, and viruses, into the marine environment (U.S. EPA 2007). They may also contain high concentrations of nutrients that can lead to eutrophication (the process that can cause oxygen-depleted "dead zones" in aquatic environments).

Vessel graywater can contain a variety of substances including (but not limited to) detergents, oil and grease, pesticides and food wastes (Eley 2000). Very little research has been done on the impacts of graywater on the marine environment, but many of the chemicals commonly found in graywater are known to be toxic (Casanova *et al.* 2001). These chemicals have been implicated in the occurrence of cancerous growths in bottom-dwelling fish (Mix 1986). Furthermore, studies of graywater discharges from large cruise ships in Alaska (prior to strict state effluent standards for cruise ship graywater discharges) found very high levels of fecal coliform in large cruise ship graywater (well exceeding the federal standards for fecal coliform from Type II marine sanitation devices, or MSDs, designed to treat sewage). These same studies also found high mean total suspended solids in some graywater sources (exceeding the federal standards for total suspended solids from Type II MSDs).

Discharge/Deposit From Vessel Accidents and Shipwrecks

Vessel groundings on shore and vessel collisions can lead to the discharge of oil, debris, and other pollutants. Similarly, the hazardous cargos, abandoned fuel and possible unexploded ordinance inside the metal hulls of slowly deteriorating deep-water shipwrecks may also threaten Sanctuary resources. A recent example of a toxic accident from a shipwreck in the Sanctuary region was the bulk carrier *Pacbaroness* that sank off of Point Conception in 1987 (see text box above).

Nonpoint Source Pollution

Nonpoint source pollution occurs when rainfall or irrigation runs over the land or through the ground, picks up pollutants and carries them to streams, rivers, wetlands and coastal waters and, during heavy rainfall, further offshore. The U.S. EPA identifies nonpoint source pollutants as the nation's largest source of water quality problems, and urban runoff as the largest source of water quality impairments to the estuaries it surveys (U.S. EPA 2002).

In the Sanctuary region, nonpoint source pollution sources are widespread. All regional watershed drainages include urban and agricultural lands yielding nonpoint source pollution. Dams, forestry, grazing, development, construction, and the physical alteration of streambeds also contribute to nonpoint source pollution. Common nonpoint source pollutants are sediments and nutrients such as fertilizers. Other nonpoint sources pollutants in the study area may include:

- Herbicides and insecticides from urban and agricultural runoff;
- Soil, grease, toxic chemicals, and heavy metals from urban runoff;
- Bacteria, viruses, and nutrients from livestock, pet wastes, and faulty septic systems;
- Accidental spills of fuel and other hazardous materials; and
- Air pollutants settling from the atmosphere into the ocean.

Watershed Runoff and Sediment Plumes

The semi-arid climate of Southern California is characterized by intense, intermittent rainfall during winter and seasonal drought during summer and autumn. Floods of coastal watersheds result from intense storms that can be exacerbated by natural phenomena such as El Niño. The time from rainfall to runoff is fairly immediate (within hours) due to the steep terrain of the foothills and Santa Ynez Mountains (Mertes *et al.* 1998). Sediments enter the coastal lagoons, estuaries, wetlands, marshes, beaches, and coastal waters, and eventually, the Santa Barbara Channel.

During winter storms, the Sanctuary region's four main rivers (the Santa Clara, Ventura, Santa Maria and Santa Ynez) discharge along the mainland coast. The Santa Clara and Ventura Rivers can produce a large sediment plume from the eastward end, moving westward into the Channel and surrounding Anacapa Island. The Santa Maria and Santa Ynez Rivers enter the Channel from the west. Upwelling following major storm events can move fine sediments toward San Miguel Island. During flood years, millions of tons of material containing nutrients and pollutants such as animal wastes, pesticides, fertilizers, PCBs, and oil can be transported into the Southern California Bight in as little as one or two days (Hickey 2000b).

In addition, the coastal mainland includes the San Antonio Creek watershed and 41 small coastal watersheds draining the south side of the Santa Ynez Mountain Range. While providing important nutrients to the Sanctuary environment, the creeks of these watersheds also contribute pollution from agricultural and urban runoff.

Coastal Wetlands

The Sanctuary region's coastal mainland watersheds include wetlands, estuaries, lagoons and other systems important to CINMS resources. These areas serve as fundamental feeding, breeding, and nursery grounds for a wide variety of species while providing natural filtration of land-based pollutants. Roughly 10 percent of the historic wetlands of Southern California remain as most have been destroyed by development (Page 1999).⁴² The coastal area between Coal Oil Point and Point Sal comprises only 15 percent of Southern California's coast, yet holds approximately 50 percent of its remaining rural and natural coastline. These coastal wetlands are recognized as "significant biological resources" (Zedler 1982) and "environmentally sensitive habitat" (County of Santa Barbara 1982). The ecological productivity of these coastal wetlands is limited by the general impacts of suburban, industrial, and agricultural development. Nutrient input into coastal and marine systems can stimulate algal growth, reduce abundance and diversity of invertebrates, impact bird-feeding behavior, and reduce oxygen concentration in the water column.

Research has detailed the adverse affects of runoff on wetlands. Nitrogen inputs from watersheds may alter wetland function by stimulating primary production and algal blooms (Valiela 1983; Coven and Zedler 1988). Zedler and Onuf (1984) argue a winter/spring pulse of dissolved inorganic nitrogen could be traced through successive trophic levels at Mugu Lagoon and thus play a major role in the functioning of Southern California systems. Page (1999) and Page *et al.* (1995) studied nutrient input in the

⁴² The study area includes a majority of these remaining wetlands.

Carpinteria Salt Marsh and found nitrate loading from watersheds (but not ammonium or phosphate) increased as a function of stream discharge. They also demonstrated the Carpinteria Salt Marsh exports nitrate and ammonium to the Santa Barbara Channel.

Community Involvement and Advisory Council Assessment

Community interest in the protection and improvement of water quality throughout the study area has been high throughout the management plan revision process. Since 1999, the Sanctuary Advisory Council has consistently identified water quality planning and protection as a priority issue of concern, repeatedly incorporating it into their annual work plan. As noted above, in 2005 the Advisory Council adopted a water quality needs assessment for the Sanctuary. This report is a good source of additional information about water quality threats and gaps in related monitoring, research, education, policies and regulations. The report did not suggest a crisis in general water quality conditions or with specific pollution sources. However, the assessment did recommend use of a proactive approach for protecting good water quality. The assessment finds that the Sanctuary is confronted with many types of anthropogenic pollution sources, over a large geographic range, and with dynamic magnitudes. These include:

- Nonpoint source pollution from the Channel Islands;
- Small vessel traffic in Sanctuary waters and the greater Santa Barbara Channel (SBC) region;
- Large vessel traffic (>300 gross tons) in the Sanctuary waters and the SBC region;
- Former ocean dumpsites;
- Ship and plane wreck sites;
- Offshore oil and gas production facilities within the SBC;
- Other point source discharges to the SBC (*e.g.* wastewater treatment facilities and cooling water effluents); and
- Nonpoint source pollution from the mainland.

This work and continued input from the Advisory Council and its working groups is integral to the development of Sanctuary programs and actions to address water quality issues.

Addressing the Issues – Strategies For This Action Plan

There are two strategies in the Water Quality Action Plan:

- WQ.1 – Offshore Water Quality Monitoring; and
- WQ.2 – Water Quality Protection Planning

These strategies address the need for CINMS to support and conduct sound monitoring for pollutants, identify pollutant sources, prioritize Sanctuary water quality threats, work closely with existing and new partners and water quality authorities, and develop and implement Sanctuary programs to address water quality concerns.

STRATEGY WQ.1 – OFFSHORE WATER QUALITY MONITORING

- Objective: To better evaluate and understand localized and large-scale spatial and temporal impacts from oceanographic and climatic changes and impacts from increases in human population in the coastal zone and subsequent pressure(s) on offshore marine resources.
- Implementation: Research and Monitoring staff

Background

State, county, city and NGO data collection efforts in the Southern California Bight (SCB) are heavily focused on coastal waters and streams. As an offshore site, CINMS is directing its efforts on the Santa Barbara Channel and the waters surrounding the Channel Islands to better evaluate and understand localized and large-scale spatial and temporal impacts from oceanographic and climatic changes (such as El Niño and La Niña events) and impacts from increases in human population in the coastal zone and subsequent pressure(s) on offshore marine resources. The water quality monitoring programs CINMS conducts address a range of water quality issues and impacts on the offshore resources of the Sanctuary. For example, one of the important goals of these efforts is to further understanding of stormwater plumes and how they may affect Sanctuary water quality and living resources.

CINMS currently supports and/or participates in several ongoing water quality data collection efforts, described below, and intends to do so on a long-term basis. In addition to collecting data, CINMS will support the processing, analysis and integration of additional relevant data for a better understanding of the dynamics of healthy functioning ecosystems and the biological implications of impacts on the resources. Statistically robust and relevant data sets will provide scientists with the ability to develop predictive models to better determine changes over time, allowing resource managers to be proactive instead of reactive to water quality impacts.

As mentioned in the Overview to this action plan, in 2005, CINMS partnered with Santa Barbara Channelkeeper to develop a pilot water quality monitoring project for the waters off of Santa Cruz and Anacapa islands. Goals of the pilot program were to: assess and identify suitable monitoring locations for longer term water quality assessment in the Sanctuary; collect water samples throughout the summer months in both high use and low uses areas, as well as areas supporting large marine mammal or seabird colonies; and analyze samples for bacterial indicators including total coliform, *Escherichia coli* (*E. coli*) and *Enterococcus*. The pilot program was a cooperative effort to better understand existing conditions and potential water quality issues associated with boating within the Sanctuary, especially at anchorages. From May to October 2005, Channelkeeper collected 35 samples from 14 locations around Santa Cruz and Anacapa Islands. Channelkeeper found indicator bacteria at several popular anchorages. Between May 2006 and May 2007, Channelkeeper processed a total of sixty water samples collected at thirty-two locations by Channelkeeper staff, along with UCSB researchers and commercial fishermen. Similar to the previous samples, in general Channelkeeper found levels of indicator bacteria to be non-detectable or very low at most sites, with a few exceptions. All samples fell below the state standards.

The next strategy focuses on water quality protection planning, but it also bears relevance to water quality monitoring. Through the course of implementing Strategy WQ.2 the Sanctuary will develop a water quality protection plan. In doing so, the Sanctuary and its partners will identify additional water quality monitoring needs. Such work has already been greatly assisted by the Sanctuary Advisory Council's 2005 report, *A Water Quality Needs Assessment for the Channel Islands National Marine Sanctuary*. However, as the Sanctuary has not yet completed a water quality protection plan, only current water quality monitoring activities supported by the Sanctuary are described in detail below.

Activities (3)

(1) Continue Support for Plumes and Blooms and Assess Management Implications. *Plumes and Blooms* is a study of the impacts of storm runoff on the marine environment of the Santa Barbara Channel. Part of an ongoing study, UCSB scientists are attempting to ground-truth SeaWiFS (Sea-Viewing Wide-Field-of-Vision Sensor) satellite acquired ocean-color data using the Sanctuary's vessel. One of the primary goals is to develop, apply and validate state-of-the-art tools for quantifying concentrations of suspended sediments, phytoplankton pigments and dissolved organic materials, using satellite ocean color imagery. *Plumes and Blooms* research provides valuable ocean color data for CINMS to better understand and manage freshwater and terrestrial inputs in the marine environment. CINMS is interested in better understanding the characteristics, dynamics and fate of large, storm-driven plumes emanating from the Ventura and Santa Clara Rivers, and the extent to which they could pose a threat to the Sanctuary's water quality and living resources.

The principal investigator for this project is UC Santa Barbara, with partnerships in NOAA, NASA, ONR, CSC and COP. Sanctuary staff will work with project leaders to appropriately incorporate *Plumes and Blooms* findings into water quality protection planning efforts (see Strategy WQ.2 below).

Status: CINMS vessel support ongoing since 1996, expected to continue aboard the R/V *Shearwater* on a competitive award basis for vessel time

Partners: UCSB; NASA; ONR; CSC; COP

(2) Continue Support for Southern California Bight Regional Monitoring Surveys. Bight '98 was a regional monitoring survey of the SCB coordinated by the Southern California Coastal Water Research Project (SCCWRP) to assess cumulative impacts of contaminant inputs and evaluate relative risks among different types of stresses. In 1998, more than 55 agencies coordinated efforts to sample 416 sites between the Mexican border and Point Conception. Multiple indicators were measured at each site to relate contaminant exposure, biological response, and habitat condition. Thirty-one trawl samples and thirty-seven benthic samples were collected off the Sanctuary's vessel at randomly selected sites in the Sanctuary. Useful comparative data about the relative health of the Sanctuary to the mainland coastal region were collected. A second survey was conducted in 2003, during which the same methods were used to gather additional data on the status of resources in the Southern California Bight. Sanctuary staff were also involved in planning for and field implementation of the Bight '08 project.

This research will assist the Sanctuary and other resource managers in answering questions about: 1) which areas do or do not meet water quality standards; 2) geographic distribution of impacts; 3) comparison of relative risk from point and nonpoint discharges; 4) the relationship between contaminant exposure and biological response; and 5) understanding historical trends at selected sites. The principal investigator for this project is the SCCWRP with partners including over 50 agencies and institutions.

Status: CINMS involvement and support began in 1998 (for Bight '98), continued in 2003 (for Bight '03), and 2008 (for Bight '08) and will continue as future projects are planned

Partners: SCCWRP as coordinator; over fifty other agencies and institutions

(3) Continue Support for CINMS Water Quality Monitoring Initiatives. Sanctuary staff, and partners from the Channel Islands Naturalist Corps, and Santa Barbara Channelkeeper are engaged in several ongoing water quality monitoring initiatives:

- Seakeeper Data Collection – In 2007 the NMSP outfitted the R/V *Shearwater* with a Seakeepers system that continuously monitors and records sea surface temperature, conductivity, dissolved

oxygen, pH, and Redox, as well as weather information and vessel position/status. The information is transmitted via satellite and Sanctuary staff can access it via web site. Data from this system will augment a variety of research and monitoring projects conducted aboard the *Shearwater*.

- Channel Islands Naturalist Corp (CINC) Data Collection – CINC volunteers collect water samples at various locations within and around CINMS and send them to the California Department of Health Services, where they are processed and become part of a biotoxin report on harmful algal blooms.
- Anchorage Data Collection – The Sanctuary has an ongoing partnership with Santa Barbara Channelkeeper, which collects and analyzes water quality samples and analysis from popular anchorages within the Park and Sanctuary.

Status: These projects and data collection have been operating since 2006/07

Partners: CINMS staff, Channel Islands Naturalist Corps, Santa Barbara Channelkeeper

STRATEGY WQ.2 – WATER QUALITY PROTECTION PLANNING

- Objective: To protect the chemical, physical and biological integrity of the Sanctuary by restoring and maintaining water quality.
- Implementation: Resource Protection staff

Background

This strategy will be implemented to protect the chemical, physical, and biological integrity of the Sanctuary by restoring and maintaining water quality. To do so, the Sanctuary, working with the NMSP West Coast Region and the Advisory Council, will 1) partner with local and state agencies and constituent groups in a comprehensive and coordinated effort for water quality protection and 2) better define the Sanctuary's role in water quality protection through policy development, research, and education. To accomplish these objectives the Sanctuary will use, to the extent appropriate, the existing Monterey Bay National Marine Sanctuary Water Quality Protection Program as a model (see www.montereybay.noaa.gov). The Sanctuary will also rely on assistance from the NMSP's West Coast Region to help build a water quality protection plan. The Sanctuary will also rely on the extensive research and documentation, and continued involvement, contributed by the Advisory Council and its working groups.

The Advisory Council's 2005 report, *A Water Quality Needs Assessment for the Channel Islands National Marine Sanctuary*, provides an important set of recommendations that will guide water quality protection planning efforts. As mentioned in the Water Quality Action Plan Overview, this report contains over twenty recommendations dealing with aspects of water quality such as: action planning; research and monitoring; jurisdiction, regulations, and policy; and public education and outreach. The report's recommendations are presented in Vol. I, Appendix E and will be instrumental for building a water quality protection program.

Activities (4)

(1) Complete Water Quality Characterization Report. In 2006, the NMSP West Coast Region and CINMS partnered with Santa Barbara Channelkeeper to develop a report characterizing water quality in the CINMS region. Finalizing this report is an important first step in the water quality protection planning process, as the report will provide an understanding of current water quality baseline conditions necessary to determine and prioritize current water quality threats. This baseline data will also be important to future water quality protection work as Sanctuary staff and partners can compare it against future data from water quality monitoring efforts described in Strategy WQ.1. Such comparisons may be used to help determine whether water quality protection efforts are having the desired effect, and to help determine when and how to adjust such efforts as necessary.

Status: To be completed by year 1

Partners: NMSP West Coast Region; Santa Barbara Channelkeeper

(2) Compile and Synthesize Information on Jurisdictional Water Quality Authorities and Responsibilities. Building on the Advisory Council's 2005 water quality needs assessment, Sanctuary staff will compile and synthesize information on jurisdictional water quality authorities and responsibilities as it pertains to water quality issues affecting the Sanctuary (including point source pollution and nonpoint source pollution, dredging, waste water management, HAZMAT response, freshwater flow, storm water permitting, etc.). This will also involve drafting descriptions of existing

agencies and management programs with responsibility for addressing water quality issues affecting the Sanctuary.

Status: To be completed by year 1

Partners: NMSP West Coast Region; Advisory Council; other regional water quality authorities and organizations

(3) Review State and Regional Water Quality Management. Work with interagency committees to evaluate and comment on management of existing and emerging water quality issues. Evaluate and develop recommendations on regional projects and permits that may impact Sanctuary water quality.

Status: Currently underway; expected to be implemented across years 1 through 5

Partners: Advisory Council; state and federal agencies; county agencies; NGOs

(4) Develop and Propose Priority Corrective Actions for Managing Sanctuary Water Quality Impacts. Building on the water quality characterization report described in activity (1) above, and the Advisory Council's 2005 water quality needs assessment (see also Vol. I, Appendix E), the Sanctuary will identify and prioritize water quality threats to Sanctuary resources, and identify needs and opportunities to coordinate and/or develop partnerships with existing authorities and interested public and private groups concerning improving Sanctuary water quality management efforts. CINMS will determine the need for and feasibility of implementing additional water quality management strategies using existing resources and programs, and ascertain the need for any additional resources to develop a Sanctuary water quality management program (to include grant proposals, public-private partnerships, volunteers, memoranda of agreement, etc.). This will also involve coordinating with Sanctuary education and outreach staff to determine water quality outreach needs. All planning activities will be based on significant input from and involvement by the Advisory Council and its working groups.

Status: Planning estimated to be complete by year 2 with implementation to follow

Partners: Sanctuary Advisory Council



Figure 44. Understanding links between regional terrestrial and marine systems is important to protecting Sanctuary water quality. (Brian D. Bresolin)

Table 9. Estimated Costs for the Water Quality Action Plan

Strategy	Estimated Annual Cost (in thousands)*					Total Estimated 5 Year Cost
	YR 1	YR 2	YR 3	YR 4	YR 5	
WQ.1: Offshore Water Quality Monitoring	\$15**	\$43**	\$43**	\$43**	\$43**	\$187**
WQ.2: Water Quality Protection Planning	\$20	\$20	\$20	\$20	\$20	\$100
Total Estimated Annual Cost	\$35	\$63	\$63	\$63	\$63	\$287

* Cost estimates exclude base budget funding requirements (salaries, overhead, etc.).

** Contributions from outside funding sources also anticipated.

Addressing the Issues – Strategies From Other Action Plans

In addition to the strategies identified in this Water Quality Action Plan, there are other strategies from other action plans either directly or indirectly addressing the issues associated with water quality:

- Strategy AU.1 – Education Program Development;
- Strategy CS.1 – Sanctuary Aerial Monitoring and Spatial Analysis Program;
- Strategy CS.8 – Automated Identification System (AIS) Vessel Tracking;
- Strategy EE.1 – Emergency Response Planning & Implementation; and
- Strategy RP.1 – Identifying & Assessing Current and Emerging Issues

Addressing the Issues – Regulations

Two Sanctuary regulations are directly associated with CINMS water quality issues. In summary these regulations prohibit:

- Discharging or depositing material or other matter, with exceptions related to fishing, vessels, military vessels, and lawful hydrocarbon activities; and
- Exploring for, developing, or producing hydrocarbons, with an exception for grandfathered leases (executed prior to March 30, 1981), and an exception for laying pipeline.

Sanctuary regulations are available at 15 CFR 922.70-922.74.